MINISTRY OF TRANSPORT AND COMMUNICATIONS
THE REPUBLIC OF MOZAMBIQUE

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR IMPROVEMENT OF THE FACILITIES FOR DREDGING AT BEIRA PORT IN THE REPUBLIC OF MOZAMBIQUE

JANUARY 1998

JAPAN INTERNATIONAL COOPERATION AGENCY
OVERSEAS SHIPBUILDING COOPERATION CENTRE

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PREFACE

In response to a request from the Government of the Republic of Mozambique, the Government of Japan decided to conduct a basic design study on the Project for Improvement of the Facilities for Dredging at Beira Port and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mozambique a study team from October 6 to October 23, 1997.

The team held discussions with the officials concerned of the Government of Mozambique, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Mozambique for their close cooperation extended to the team.

January, 1998

Kimio Fujita
President
Japan International Cooperation Agency

January, 1998

Letter of Transmittal

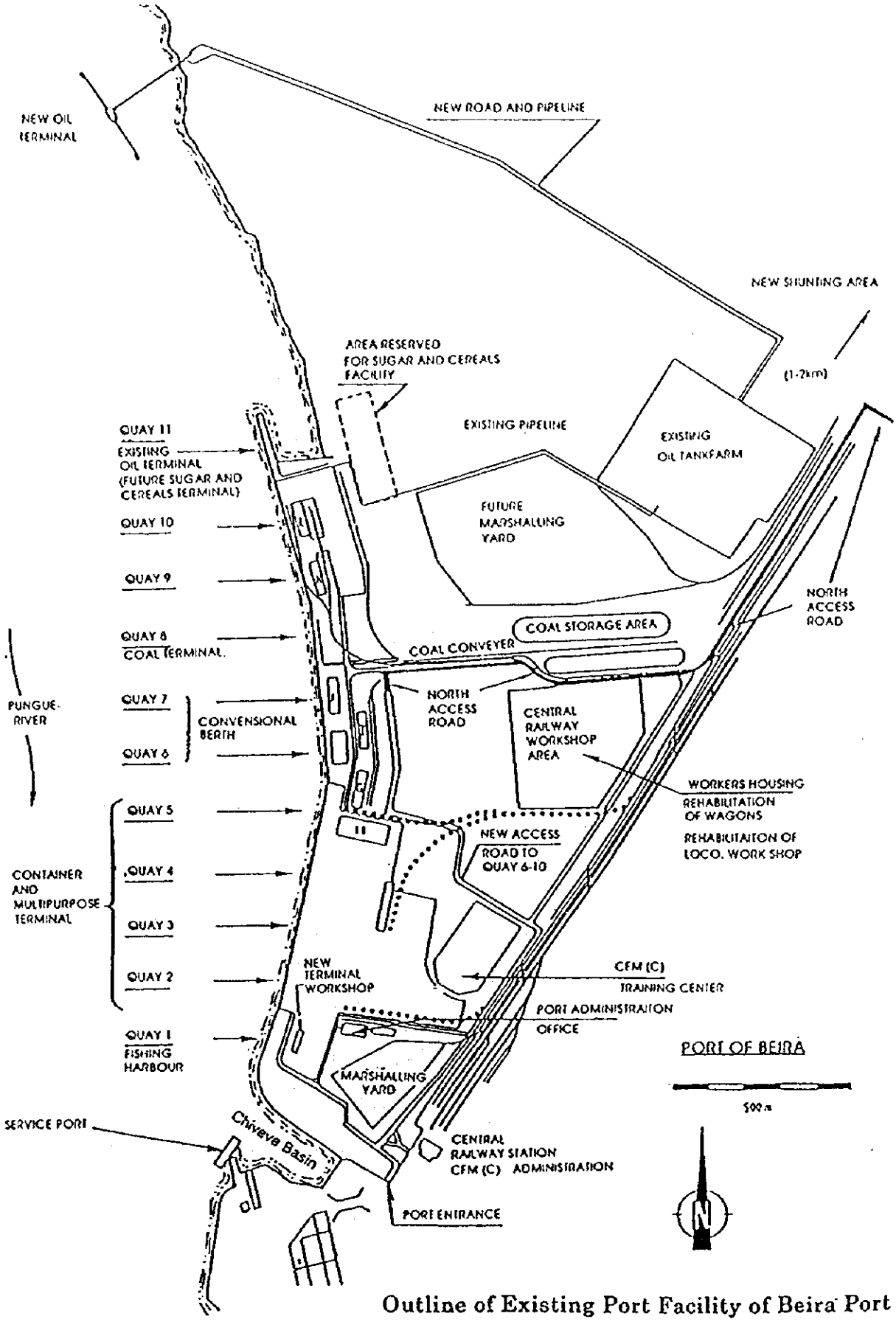
We are pleased to submit to you the basic design study report on the Project for Improvement of the Facilities for Dredging at Beira Port in the Republic of Mozambique.

This study was conducted by Overseas Shipbuilding Cooperation Centre, under a contract to JICA, during the period from September 4, 1997 to January 7, 1998. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mozambique and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

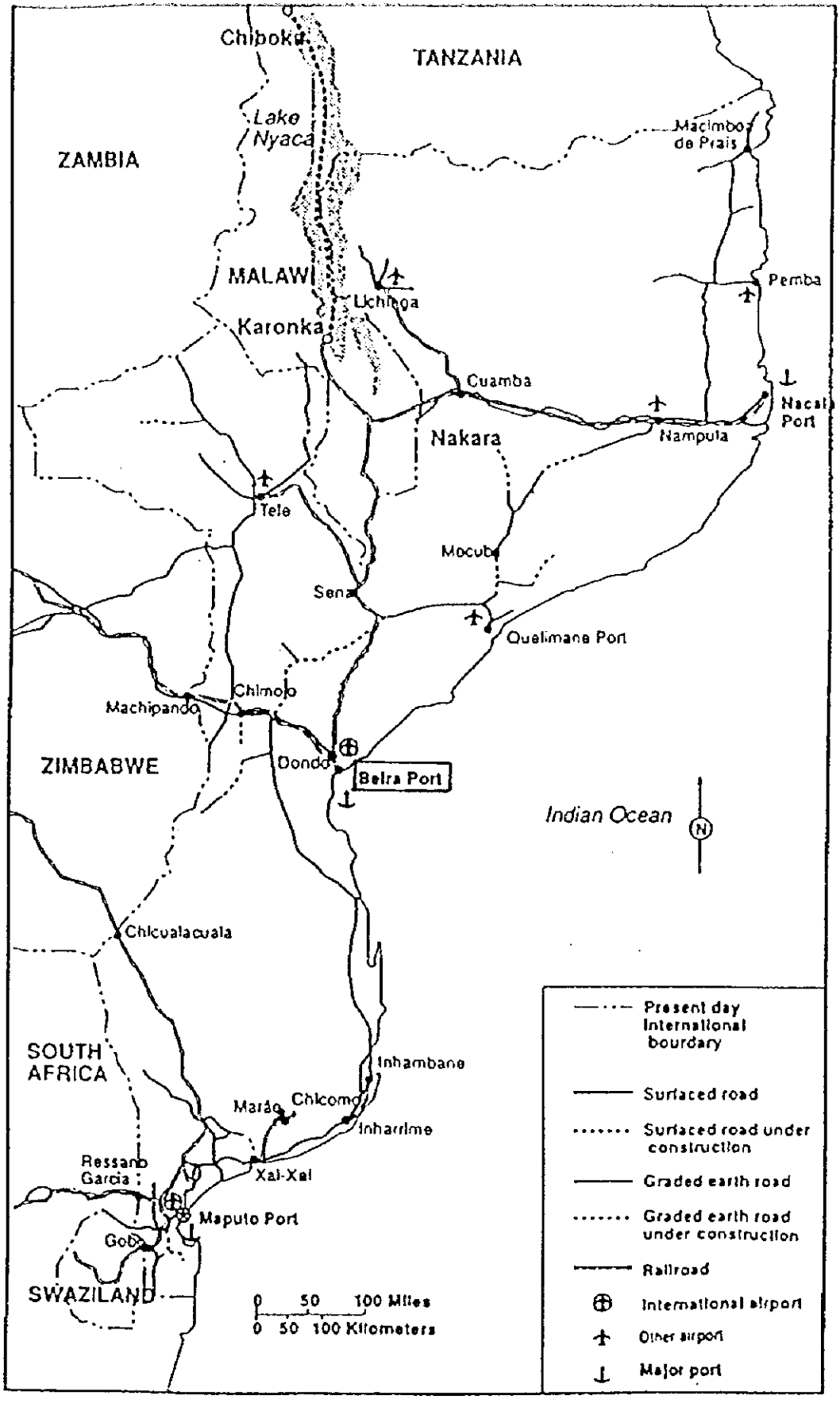
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

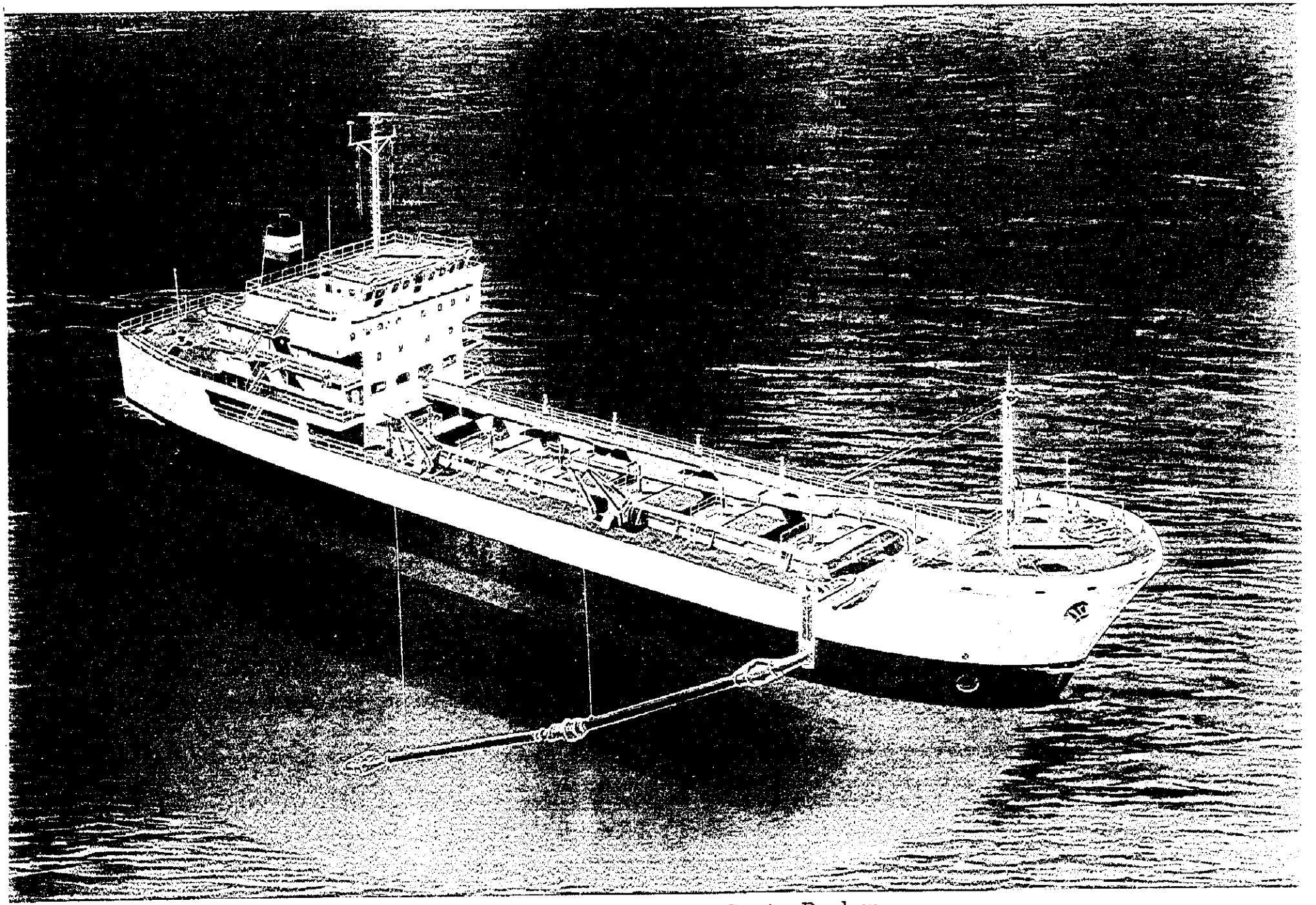
Toshimasa Suzuki
Project manager,
Basic design study team on
the Project for Improvement of the Facilities
for Dredging at Beira Port
Overseas Shipbuilding Cooperation Centre



Outline of Existing Port Facility of Beira Port



Location Map of Beira Port, Mozambique



Perspective of Self-propelling Trailing Suction Dredger

ABBREVIATIONS

AfDF	African Development Fund
CD	Chart Datum
CDL	Chart Datum Level
DAC	Development Assistance Committee
EDF	European Development Fund
GDP	Gross Domestic Product
GNP	Gross National Product
HAT	Highest Astronomical Tide
HF	High Frequency
IDA	International Development Association
IMF	International Monetary Fund
LAT	Lowest Astronomical Tide
Loa	Length Overall
Lpp	Length between Perpendiculars
MF	Medium Frequency
MHWN	Mean High Water Neap Tide
MHWS	Mean High Water Spring Tide
MLWN	Mean Low Water Neap Tide
MLWS	Mean Low Water Spring Tide
MSL	Mean Sea Level
ODA	Official Development Aid
OECD	Organization for Economic Cooperation and Development
WFP	World Food Program
VHF	Very High Frequency

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(Appendices)

1. Member List of the Survey Team
2. Survey Schedule
3. List of Party Concerned in the Recipient Country
4. Minutes of Discussion
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Chapter 1 Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

In the Republic of the Mozambique there are three main corridors that connect the country with the neighboring inland countries as international transport routes, i.e. Beira Corridor, Maputo Corridor and Nacala Corridor. Among these three, particularly important is the Beira Corridor with Beira port as its entry/exit point, which is the shortest route to Zimbabwe and Malawi, and the port, railway and roads that constitute the corridor have now been fairly rehabilitated or improved. Because of its recognized importance, even during the long lasted civil war in Mozambique, this corridor had been kept open for traffic by the desperate guard of Mozambican and Zimbabuwean armies.

Situated at the estuary of Punge river, Beira port is a commercial port that handles 2.4 ~2.6 million tons of cargoes annually, with a total length of 1.7Km of berths having the water depths of 10m for general cargo ships, 12m for container ships and 13.5m for oil tankers. Its channel was dredged down to 8m deep during 1989 and 1990 so as to be capable of accommodating ships of up to 30,000 DWT class. However, no appropriate maintenance dredging has been carried out thereafter. As the consequence, the cannel has been shallowed at many parts due to incessant siltation, into the present condition of 5m in general. Under such channel water depth, many of calling ships are compelled to do tide waiting for entry and not allowed to navigate the channel during night time. Thus, the execution of dredging work to deepen the channel and to maintain such a deepened depth needs to be executed as the essential task in order to revive the port function.

Mozambican Dredging Company (EMODRAGA), an independent dredging public enterprise, is the only organization in charge of dredging in this country. It owns and operates only one aged trailing suction hopper dredger that is almost exclusively used for maintenance of Maputo port since 1990 and can not afford to be used in Beira for dredging of the voluminous siltation.

To cope with such critical situation the Mozambican government made an official request to the Japanese government for providing a grant aid to construct a trailing suction hopper dredger. Answering to this request, the Japanese government sent a preliminary study team under the grant aid scheme in February, 1996, and as a result recognized the necessity and urgency of provision of such grant aid. But both

governments concluded that, prior to the planning of the construction, a study to analyze the phenomenon of siltation and work out long-term countermeasures against it should be preceded. In March, 1996 the Mozambican government requested the Japanese government to cooperate for formulation of a master plan for effective countermeasures against siltation, and in September, 1996 the latter dispatched a preliminary study team for a development study, and discussions were held between both governments on the contents of the official request, scope of works for the development study and how to carry out it. Then, the development study, i.e. "The Study for Maintenance and Improvement Plan of Access Channel of Beira Port in the Republic of the Mozambique" was started in December, 1996, and this basic design study has been carried out on the basis of the Interim Report that was already prepared in the process of the development study, in which the necessary design conditions for the dredger to be constructed under the grant aid scheme such as environmental conditions, dredging plans, etc. were made clear.

Chapter 2 Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Objectives of the Project

Among the main ports of the Republic of Mozambique, Maputo and Beira have been performing a dominant role not only as the principal ports for the domestic and international maritime traffics of Mozambique but also as the irreplaceable transit ports for the international trade of the neighboring inland countries having no exit to the sea. Traditionally, the handling of such transit cargoes in these ports has been constituting an important source of revenue to the Mozambican national economy.

As for the port of Beira, because of its strategic geographic location that constitutes the shortest international transport corridor to Zimbabwe, Malawi and Zambia through railways, roads and rivers, a ten-year development program to rehabilitate and develop Beira corridor was worked out by Southern African Development Coordination Conference, SADC (consisting of the ten member countries of Lesotho, Swaziland, Mozambique, Zimbabwe, Botswana, Namibia, Tanzania, Malawi, Angola and Zambia) and the Beira Corridor Authority, BCA, was started by the Mozambican government in 1985 for designing, monitoring and managing the implementation of the ten-year program under the introduction of financial and technical assistance from international community across the world. BCA had been doing these activities with assistance of experts from Nordic countries in coordination with SADC until its closing in 1996.

Under the ten-year program, rehabilitation and development of Beira port were planned and have been almost completed so as to be able to accommodate regular calling of vessels of up to 30,000DWT class. The commercial berths of about 1.7 km in total length as well as the cargo handling facilities were rehabilitated, and the capital dredging was carried out during 1989 and 1990 up to the water depths of 10m for the general cargo ship berths, 12m for the container ship berths, 13.5m for the oil tanker terminal and 8m throughout the access channel. Ever since, however, no appropriate maintenance dredging has not been carried out.

Consequently, the water depth of the access channel has now become shallower to less than 6m here and there, even to less than 2m at some parts due to continuous siltation, which makes visiting ships inevitable to wait for high tide and prohibited from night navigation. Thus the present bottleneck of the decreased water depth of the channel is hampering the originally planned accessibility of incoming ships and thereby resulting in lower utilization of the cargo handling facilities. Therefore, above all the interim and maintenance dredging of the channel is deemed the most essential task for the port to regain its planned function.

This project is to procure a dredger with which EMODRAGA, an independent dredging public enterprise controlled by the Ministry of Transport and Communications, will carry out the maintenance dredging of the port, thereby contributing to the development of the Beira corridor and the national economy of SADC member countries.

2-2 Basic Concept of the Project

2-2-1 Present Status of Channel and Calling Ships

(1) Present Status of Channel

As shown in the Fig.2-2-1 "Layout of Access Channel and Dumping Sites", the water depth of E8 is partially less than 6m and that in E9 and E10 partially less than 2m. The channel of Beira port as a whole under the present status can be roughly regarded as a channel of 5m water depth in general. It means that the draft of a calling ship on the basis of the worst condition of the mean low water spring tide (+0.9m) shall be limited to less than 4.9m from chart datum level provided the clearance between ship bottom and sea bed is to be kept at 1m.
But actually ships with a deeper draft are enterable by tide waiting thanks to the wide range of tide as mentioned below.

The heights of tide levels from chart datum level in Beira are as follows;

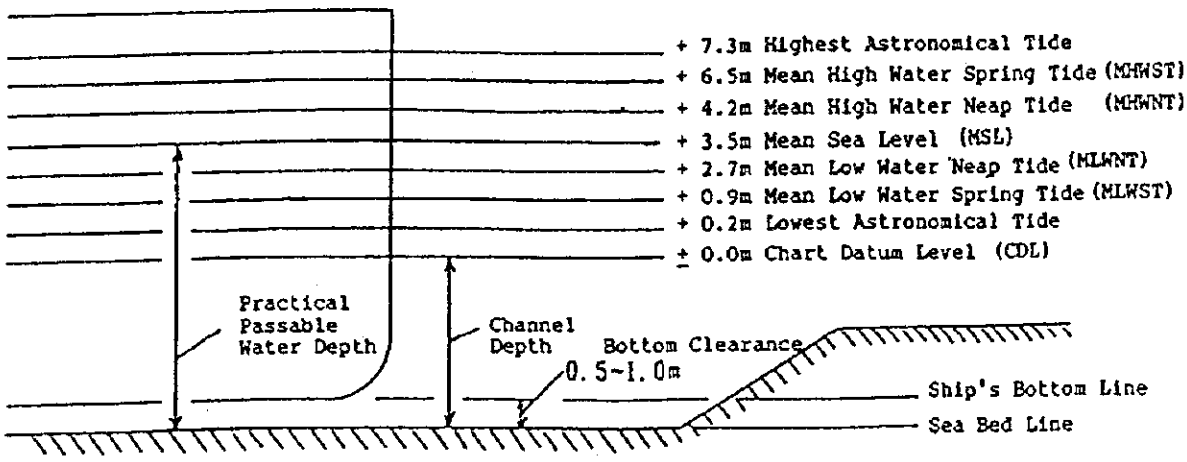


Fig. 2-2-2 Tide Levels in Beira

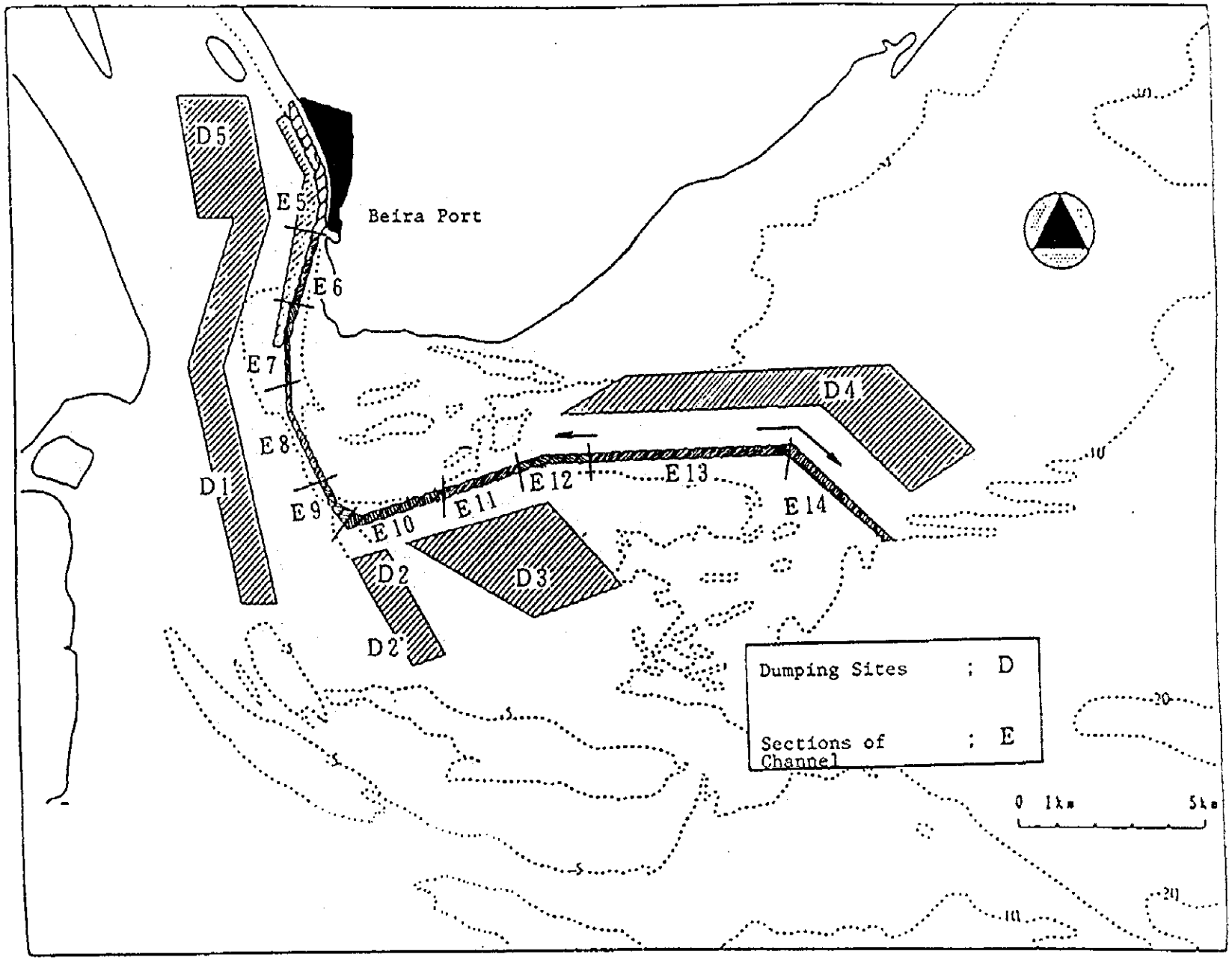


Fig. 2-2-1 Layout of Access Channel and Dumping Sites

Considering the two time occurance of high and ebb tides per day and of spring and neap tides per month, ship's drafts allowable for entry will be;

Without tide waiting;	0.9m + 4.0m = 4.9m(MLWST)
Almost without tide waiting;	2.7m + 4.0m = 6.7m(MLWNT)
After tide waiting for max. 6 hours;	3.5m + 4.0m = 7.5m(MSL)
After tide waiting for max. 12 hours;	4.2m + 4.0m = 8.2m(MHWNT)
After tide waiting for max. one week	6.5m + 4.0m = 10.5m(MHWST)

Size of a ship in deadweight with 7.5m draft, a condition that needs comparatively short tide waiting, is estimated at abt. 7,500 DWT for a cargo ship, abt. 14,000 DWT for a oil tanker and abt. 12,000 DWT for a container ship.

(2) Transition of Tide Waiting Time of Calling Ships

In comparison with the tide waiting time in 1981, just after the attainment of 8m channel water depth by completion of the dredging work, it was increased at the average rate of 1.8 times a year until 1996, when the channel water depth was reduced to 5m. As a result, big ships, which require higher demurrage, and container ships, which attach importance to scheduled operation, began to avoid to call at Beira Port, and a phenomenon started that cargoes, most suitable to be handled primarily through Beria Port, were transferred to neighboring ports, such as Maputo. In consequence, cargo transportation distance on land and incidental expenses were increased.
Transition of the tide waiting time of ships arrived at Beira Port with a draft of more than 5m is shown in Table 2-2-1.

Table 2-2-1 Comparison of Tide Waiting in 1991 and 1996

Year	1991	1996
Channel water depth (m)	8.0m	5.0m
Numbers of arrival ships (draft more than 5m)	243	289
Numbers of tide waiting ships	28	202
Ratio of tide waiting ships(%)	11.5	69.9
Tide waiting time (hours)	170.8	3,043.2
Tide waiting time (days)	7.1	126.8
Rate of increase per year(%)	177.9%/year	

(3) Present Status of Calling Ships

According to the 1996 statistics of calling ships, the number of the calling ships with a draft of less than 7.5m occupies 59% for cargo ships, 23% for oil tankers and 68% for container ships: They aggregate 210 in number out of all calling ships of 364, i.e. 58% of the total

In other words, it can be said that 42% of all calling ships underwent a substantial tide waiting for their entry.

Not a few of the ships that entered with a draft of less than 7.5m, such as larger oil tankers and container ships, are deemed to have reduced their draft by decreasing their cargo loading to less than 7.5m intentionally to avoid tide waiting that would cause them an unbearable demurrage cost.

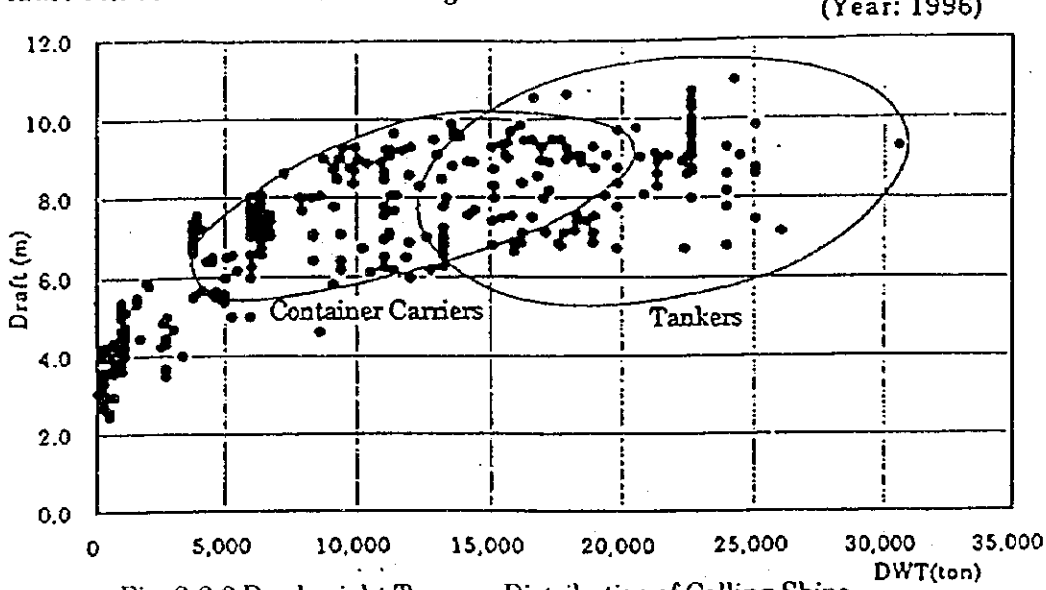


Fig. 2-2-3 Deadweight Tonnage Distribution of Calling Ships

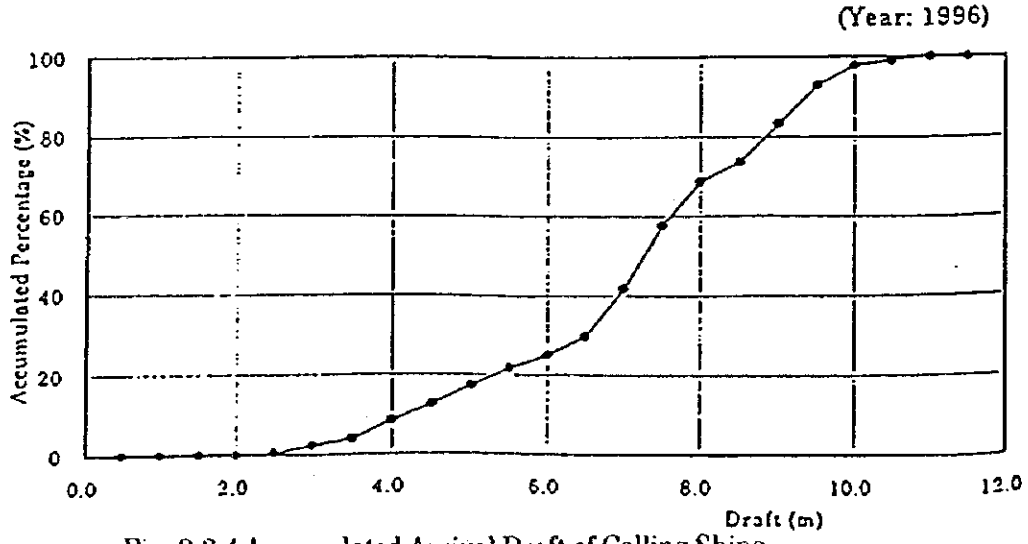


Fig. 2-2-4 Accumulated Arrival Draft of Calling Ships

(4) Study of Channel Water Depth

The relation between sizes of navigable ships and water depths on the condition of the Mean Sea Level of 3.5m that would not give rise to a substantial tide waiting, is shown below:

Table 2-2-2 Channel Water Depths and Sizes of Navigable Ships

Channel Water Depth	5.0m	5.5m	6.0m	6.5m	7.0m	8.9m
Allowable Draft *	7.5m	8.0m	8.5m	9.0m	9.5m	10.5m
Cargo Ship	7,500t	9,000t	10,500t	12,500t	15,000t	18,500t
Oil Tanker	14,000t	15,500t	18,000t	20,500t	23,000t	28,000t
Container Ship	12,000t	13,500t	15,000t	17,000t	19,000t	23,000t

*Remark: Allowable draft = Channel Water Depth (below CDL) + 3.5m (MSL) - 1.0m (clearance between ship bottom and sea bed)

On the other hand, the number of ships by kind that called on Beira in 1996 are as follows:

Oil tankers	62 vessels	17%
Bulk carriers	68 vessels	19%
Container ships	152 vessels	42%
General cargo ships	41 vessels	11%
Others	41 vessels	11%
Total	363 vessels	100%

As shown above, container ships occupied the biggest share in the calling ships. Of the 152 container ships, 148 had a draft of less than 9m and the remaining four entered the port with less than 9.5m.

In this project, therefore, the allowable draft is set at 9.0m to enable almost all container ships which will occupy the biggest share and call regularly to enter the port without tide waiting. In this case, the channel should have a water depth of 10m with the safety margin of 1.0m, and this depth can be secured on the channel water

depth of 6.5m plus MSL of 3.5m. Consequently, to maintain the channel at water depth 6.5m is made as the basic requirement of this project.

As the 1996 record shows 83% (including container ships) of all calling ships had a draft of shallower than 9.0m, a distinctive effect for solution of tide waiting loss can be brought by maintenance of the channel at 6.5m water depth, even though rehabilitation to the original 8.0m remains an ideal.

2-2-2 Estimation of Siltation Volume

Average annual siltation volume has been estimated on the calculated volume of siltation accumulated during one year between August 1990 which is immediately after the completion of the capital dredging and August 1991 as well as on the calculated siltation volume obtained from the sounding maps of August and April 1996.

Relation between water depth and siltation is considered that the deeper the water depth is, the more the siltation arises. Therefore, from the simulation to investigate this relation, the annual maintenance dredging volume by water depth has been calculated, as shown below in Fig. 2-2-5 "Channel Water Depth and Dredging Volume".

For this Fig. 2-2-5, the annual dredging volume to maintain the channel at water depth of 6.5m is estimated at 1,170,000m^3.

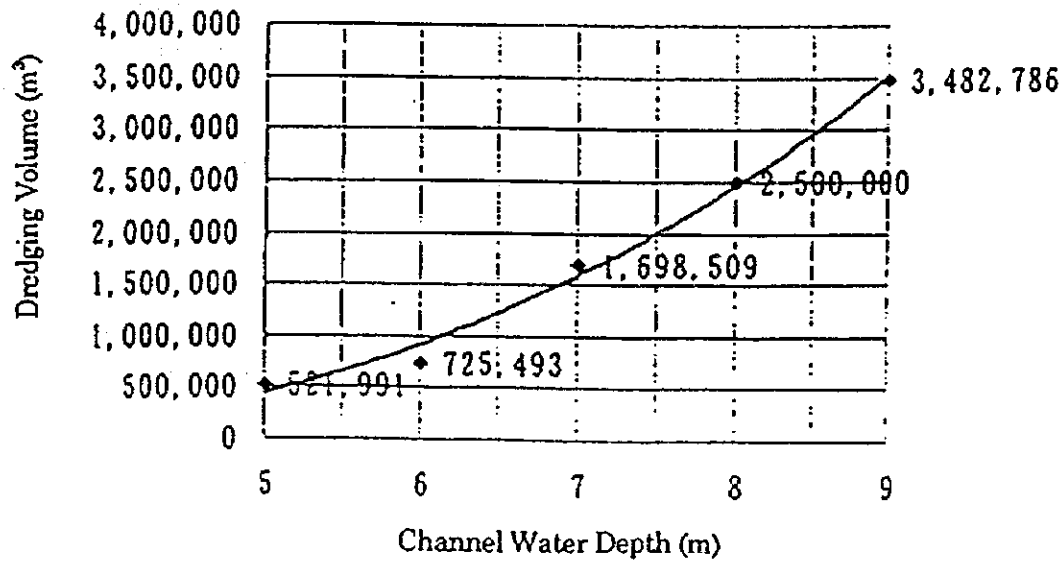


Fig. 2-2-5 Channel Water Depth and Dredging Volume

2-2-3 Type of Dredger

In selecting and designing the most suitable type for the intended purpose of this project from among various types of dredgers, full consideration has been given to the conditions and requirements of the project and to the functions and features of respective types of dredgers.

Since the dredger to be procured under this project is intended to engage in the maintenance dredging of the access channel of the port, the dredger is required to be able to fulfil the dredging work without hindering navigation of incoming/outgoing vessels and also to maintain her own safe navigation and to avoid such marine risks as collision without difficulty. To comply with such requirements, it should be taken into due consideration that the dredger shall have a manoeuvring function to enable it make a quick turning, not to mention qualified crew on board.

Therefore, such basic design has been worked out that the dredger shall be of a self-propelling trailing suction type that is capable to easily change her direction by means of twin sets of propulsion engine, propeller and rudder, each installed at port and starboard sides respectively, for independent control of propulsive power of each side in emergencies, load the dredged soil into her own hold and then dump them in prescribed dump sites by shuttling between the dredging sites and the dump sites.

Selection of a self-propelling trailing suction type can also be justified from the viewpoint of its operation as the most suitable for EMODRAGA, considering the existing dredger of the same type being operated by them.

2-2-4 Study of Dredging Plan

(1) Dredging Work Plan

Dredging work plan for the new dredger is formulated as follows:

Annual working weeks (days):

44 weeks (220 days)

Remaining 8 weeks to be used for dry-docking, afloat repair work and non-operational days due to unfavorable weather.

Weekly working days;

5 days for dredging work (departure on Monday morning and return on Saturday morning)

Saturdays for periodic checking/maintenance work

Sundays for holiday/changing crew

Working hours per working days;

24 hours on duty, of which actual working ratio is 80%. Accordingly effective working time is 19.2 hrs.

Annual effective working hours:

4,224 hrs (19.2 hrs/day x 220 days/year)

Number of crew;

54 persons (one gang of 18 persons x 3 shifts)

2 gangs always on board and 1 gang on shore

Each gang staying on board for 2 weeks consecutively, and one of the three to be alternated weekly

(2) Composition of Sea Bed Soil

According to the result of the Study for Maintenance and Improvement Plan of Access Channel of Beira Port, the sea bed soil of the channel is as follows:

	Silt	Sand
Composition:	32%	68%
Specific gravity:	2.65t/m^3	2.65t/ m^3
Specific gravity in situ:	1.50t/ m^3	1.80t/ m^3
Loading rate in hopper	55%	75%

(3) Topography of Channel and Dumping Sites

Location of the channel to be dredged and dumping sites for dredged soil are shown in Fig. 2-2-1 "Layout of Access Channel and Dumping Sites".

Dredging work to be carried out on the dredging plans made on the respective sections of the channel consists of cycles of dredging works and dumping works to/from predetermined dumping sites. Therefore, dredging efficiency depends on this cycle time.

Also, water depth of respective dumping sites should be carefully checked so as for the dredger to keep a draft with an appropriate margin to the sea bed, particularly considering the opened position of the ship's bottom doors at a dumping site.

2-3 Basic Design

2-3-1 Design Concept

(1) The Environmental Conditions

a) Climatic and Oceanic Conditions

Beira port is a good harbor with a mild climatic and oceanic condition, rarely hit by a cyclon. Therefore, the design condition of wind force 10m/s and wave height 2m/s is set in accordance with the past observation data, so that the number of unworkable days is limited to about 10 days in a year.

Beira port has a comparatively large range of tide, as shown in Fig.2-2-2. Considering such range of tide and the distance between the chart datum level and the sea bed, the design conditions have been determined that (i) ship's draft be 4m, (ii) minimum water depth at dumping site be 6m and (iii) length of the drag arm be sufficient for dredging depth of 20m at the angle of 45 degree.

As the sea current at the access channel, combined with the river current from the Pungue river, amounts to 4 knots, the dredger is designed to be capable to carry out dredging as planned against the head current of 3.5 knots.

b) Topography of Channel and Dumping Sites

Refer to Fig. 2-2-1 "Layout of Access Channel and Dumping Sites".

c) Composition of Soil

The sea bed soil consists of 32% of silt and 68% of sand. Their specific gravity in situ is 1.5 for silt and 1.8 for sand. The dredging plan will be made on the assumption of the density (situ) when pumped and stored in the hopper of the dredger.

The ratio of stored soil volume against the hopper capacity is set at 55% for silt and 75% for sand, given the overflowing of supernatant water in the hopper being made.

(2) Work Plan and Manning Plan

Working time is planned on the basis of 24 hour operation for five days from Monday through Friday with two gangs of 18 crew always on board and the each gang working by 2 sifts. But actual working time is estimated at 19.2 hours/day because the actual effective time of dredging work has to be presumed to be 80%, namely, 9.6 hours per gang/day, taking into account the time needed for the dredger to go to dredging sites, to return to the base, to do unmooring/mooring work upon departure from/arrival to the base, etc.

Weekly working days are set at 5 days, with Saturdays to be used for checking and maintenance of machinery/equipment and Sundays for holiday. Each gang will stay on board for 2 weeks consecutively and then be shifted to onshore work for one week, which means there need to be 3 gangs of 18 crew, i.e. 54 crew members in total.

Dredging work will be carried out for 44 weeks annually (Total annual workable days; 220 days, Total annual workable hours; 4,224 hours). As for the remaining 8 weeks, 4 weeks will be reserved for annual docking and the other 4 weeks for afloat repair/consumable parts exchange, etc. and non-operation due to unfavorable weather.

(3) Annual Number of Dredging Cycles

Dredging cycle plan on the basis of the soil volume to be dredged annually being 1.17 million m^3 is studied below.

The output of propulsion engine is set so as for the dredger to be able to do dredging at a speed of 3 knots with the drag arm being trailed even against the head current of 3.5 knots, and to navigate at 10.2 knots at fully loaded condition and at 10.5 knots at unloaded conditions after dumping.

Dredging time in a cycle is set at 1.0 hour for silt and 1.25 hours for sand, and dumping time at 0.15 hour for silt and 0.25 hour for sand.

On the basis of the above design conditions, soil volume to be dredged, necessary time for dredging and dumping, distance to and from dumping sites established in regard to respective dredging and prescribed dumping sites, the maintenance dredging plan is made and shown on Table 2-3-1 and Table 2-3-2. Table 2-3-1 shows the dredging plan in which a certain section is continuously worked till dredged to a required depth by using a distant dumping area at low tide when dumping operation with full hopper load is not possible. While, Table 2-3-2 shows the plan of dredging the sections E11 and E14 which are close to deep dumping areas at low tide. And if that the relation among, annually required number of cycles, necessary annual working hours and the hopper capacity of the dredger are calculated, when the hopper capacity being 1,000m^3, annual total dredging cycles are calculated as 1,749, and necessary annual working time becomes 3,470~3,480 hours, which accounts for about 82% of the annual effective working time, thus confirmed the scale is appropriate to maintain the channel depth at 6.5m.

(4) Ship's automation and Remote Control

The dredger is basically so designed as to be remotely controlled from the bridge in respect of machinery/equipment for maneuvering and dredging work, such as revolution control of main engine and dredge pump driving engine, opening/closing of dredge valves, lifting/lowering of drag arm, opening/closing of hopper doors, start/stop and propulsion control of bow thruster. Electric-hydraulic type will be adopted for the remote control system as far as possible for easier maintenance. Adoption of automation will be limited to the range of maintain ship's safety.

(5) Ship's Structure and Machinery/Equipment

In view of the ship's operation at a shallow water depth where the distance between ship's bottom and sea bed is very small, consideration will be give so that the ship can be kept even as much as possible and have a hull form making smoother the inflow of water into her propellers.

As for the ship's structure, consideration will be given to its robustness, with

particular attention to anti-corrosion measures for the outer shell of her bottom and sides.

For her machinery/equipment, the ones that do not need no especial or complicated skill for operation will be adopted.

Furthermore, in selection of makers of her machinery/equipment due attention will be given to the possibility of procurement of their spare parts domestically or from the Republic of South Africa for the convenience of after-delivery maintenance and repair of the dredger, so far as there would be no disadvantage in respect of their quality, delivery time and price.

(6) Local Condition

As the BEIRANAVE shipyard located in CHIVEVE of Beira will become a principal repair yard for the dredger, the facilities and capability of this shipyard will be taken into consideration in designing the dredger.

Table 2-3-1 Maintenance Dredging Plan (soil to be dumped at a distant site at low tide)

Hopper Capacity = 1000 m3
Ship speed full 10.2 kt, ballast 10.5 kt

Dredging Time Silt 1.00 hr Sand 1.25 hr

Turning Time 0.25 hr

Section	E5		E15		E4		E6		E7		E8		E9	E10	E11	E12	E13	E14	Total
Siltation Vol m^3/y	35,484		55,073		81,325		33,295		37,901		43,828		204,784	437,543	71,898	0	0	173,318	1,174,449
Siltation Vol %	3		5		7		3		3		4		17	37	6	0	0	15	100
Soil: Silt or Sand	Silt		Silt		Silt		Silt		Sand		Sand		Sand	Sand	Sand	Sand	Sand	Silt	
Dred'g/Turn'g Time hr	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.25	
Soil in Hopper %	55		55		55		55		75		75		75	75	75	75	75	55	
Soil in Hopper m3	550		550		550		550		750		750		750	750	750	750	750	550	
Dumping Area (DA)	D1(98%)	D2	D1(98%)	D2	D1(98%)	D2	D1(98%)	D2	D1(90%)	D2	D1(90%)	D2	D2(100%)	D2(100%)	D4	D4	D4	D4	
Sailing Distance km	11.0	13.1	9.2	11.3	9.7	11.8	6.9	9.0	4.9	10.7	3.0	8.5	2.7	1.7	1.8	1.5	1.5	1.5	
Sailing Time to DA hr	0.58	0.69	0.48	0.60	0.51	0.62	0.37	0.48	0.26	0.57	0.16	0.45	0.14	0.09	0.10	0.08	0.08	0.08	
Dumping Time hr	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	
Sailing Time fm DA hr	0.56	0.67	0.47	0.58	0.50	0.60	0.36	0.46	0.25	0.55	0.15	0.44	0.14	0.08	0.09	0.08	0.08	0.08	
Cycle Time hr	2.54	2.76	2.36	2.58	2.41	2.63	2.12	2.34	2.26	2.87	2.06	2.64	2.03	1.92	1.94	1.91	1.91	1.56	
Av Cycle Time hr	2.55		2.36		2.41		2.13		2.32		2.12		2.03	1.92					
Required No of Cycle	65		100		148		61		51		58		273	583	96	0	0	315	1749
Req'd Working Hour hr	164.4		236.3		356.7		128.6		117.1		123.9		554.8	1121.5	185.8	0.0	0.0	490.5	3,480
Working Hour Ratio %	4.7		6.8		10.3		3.7		3.4		3.6		15.9	32.2	5.3	0.0	0.0	14.1	100.0
T.Dred/Turn'g Time hr	80.6		125.2		184.8		75.7		75.8		87.7		409.6	875.1	143.8	0.0	0.0	393.9	2,452.1
Sailing Time hr	74.1		96.1		149.7		43.9		28.7		21.7		77.0	100.5	18.0	0.0	0.0	49.4	659.1
Dumping Time hr	9.7		15.0		22.2		9.1		12.6		14.6		68.3	145.8	24.0	0.0	0.0	47.3	368.5
																		Total	3,479.8

Silt/Sand Ratio %
Silt 32
Sand 68

Average Cycle Time 1.99 hr

Annual Working Hours
Week 44
Day 5
Hour 24
Efficiency 0.8
4,224 hr

Annual Required Working Hours

Dred'g/Turn'g Time	2,452 hr	70%
Sailing Time	659 hr	19%
Dumping Time	369 hr	11%
Total	3,480 hr	100%

Required Working Hours
3,480 hr

Required/Annual Working Hours Ratio 82.4 %

Table 2-3-2 Maintenance Dredging Plan (sections E11 and E14 to be dredged at low tide)

Hopper Capacity = 1000 m3 Dredging Time Silt 1.00 hr Sand 1.25 hr Turning Time 0.25 hr
Ship speed full 10.2 kt. ballast 10.5 kt

Section	E5	E15	E4	E6	E7	E8	E9	E10	E11	E12	E13	E14	Total
Siltation Vol m^3/y	35,484	55,073	81,325	33,295	37,901	43,828	204,784	437,543	71,898	0	0	173,318	1,174,449
Siltation Vol %	3	5	7	3	3	4	17	37	6	0	0	15	100
Soil: Silt or Sand	Silt	Silt	Silt	Silt	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Silt	
Dred'g/Turn'g Time hr	1.25	1.25	1.25	1.25	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.25	
Soil in Hopper %	55	55	55	55	75	75	75	75	75	75	75	55	
Soil in Hopper m3	550	550	550	550	750	750	750	750	750	750	750	550	
Dumping Area (DA)	D1(100%)	D1(100%)	D1(100%)	D1(100%)	D1(100%)	D1(100%)	D2(100%)	D2(100%)	D4	D4	D4	D4	
Sailing Distance km	11.0	9.2	9.7	6.9	4.9	3.0	2.7	1.7	1.8	1.5	1.5	1.5	
Sailing Time to DA hr	0.58	0.48	0.51	0.37	0.26	0.16	0.14	0.09	0.10	0.08	0.08	0.08	
Dumping Time hr	0.15	0.15	0.15	0.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	
Sailing Time fm DA hr	0.56	0.47	0.50	0.36	0.25	0.15	0.14	0.08	0.09	0.08	0.08	0.08	
Cycle Time hr	2.54	2.36	2.41	2.12	2.26	2.06	2.03	1.92	1.94	1.91	1.91	1.56	
Av Cycle Time hr	2.54	2.36	2.41	2.12	2.26	2.06	2.03	1.92					
Required No of Cycle	65	100	148	61	51	58	273	583	96	0	0	315	1749
Req'd Working Hour hr	164.1	235.9	356.0	128.4	114.0	120.6	554.8	1121.5	185.8	0.0	0.0	490.5	3,472
Working Hour Ratio %	4.7	6.8	10.3	3.7	3.3	3.5	16.0	32.3	5.4	0.0	0.0	14.1	100.0
T.Dred/Turn'g Time hr	80.6	125.2	184.8	75.7	75.8	87.7	409.6	875.1	143.8	0.0	0.0	393.9	2,452.1
Sailing Time hr	73.8	95.7	149.0	43.6	25.6	18.3	77.0	100.5	18.0	0.0	0.0	49.4	651.0
Dumping Time hr	9.7	15.0	22.2	9.1	12.6	14.6	68.3	145.8	24.0	0.0	0.0	47.3	368.5
												Total	3,471.7

Silt/Sand Ratio %
Silt 32
Sand 68

Average Cycle Time 1.98 hr

Annual Working Hours
Week 44
Day 5
Hour 24
Efficiency 0.8
4,224 hr

Annual Required Working Hours

Dred'g/Turn'g Time	2,452 hr	71%
Sailing Time	651 hr	19%
Dumping Time	369 hr	11%
Total	3,472 hr	100%

Required Working Hours
3,472 hr

Required/Annual Working Hours Ratio 82.2 %

2-3-2 Basic Design

(1) General and Hull Part

The vessel shall be a trailing suction hopper dredger, which is employed to maintenance dredging of the access channel of Beira Port. The vessel shall be designed for operation to dredge of sea bed material consists of silt, fine sand and coarse sand.

The vessel's hull shall be constructed with steel, provided with 5 bladed fixed pitch type twin propellers driven by each one of marine diesel engine through the line of shafting and twin rudders. One set of dredging pump shall be arranged in forward pump room and driven by exclusive diesel engine. One drag arm shall be provided on starboard side. Dredged material in the hopper shall be dumped out through bottom doors.

Forecastle deck, poop deck and deck house shall be constructed. One mud hold (Hopper) of 1,000m^3 shall be provided at the mid-body of the vessel.

The material, machinery and equipment set forth in the specifications and to be utilized for the construction of the dredger shall be manufactured in accordance with the rules of Classification Society, Builder's Standard, JIS-Japanese Industrial Standard and/or Manufacturer's Standard.

- Flag, Port of Registry : Mozambique, Beira

- Classification

  BV, I 3/3 E+, Hopper Dredger Coastal Waters, Dredging within 8 miles from shore

- Principal Dimensions

Length, o.a.	abt.70 m
Length, b.p.	65.0m
Breadth, mld	14.0m
Depth, mld	4.7m
Working draught, mld	4.0m

- Deadweight

  Deadweight at designed draught abt. 1,800t

  Deadweight at designed draught shall be as follows

Soil	1,600t
Fuel oil	120t
Fresh water	60t
Constant and other	20t

- Cargo Carrying Capabilities

  Mud hold capacity abt 1,000m^3

- Tank Capacity

Fuel oil	abt. 150m^3
Fresh water	abt. 30m^3
Water ballast	abt. 150m^3

- Speed, Fuel Consumption and Endurance

  Free running speed abt. 10.2kt

  on designed draught at abt.80% output of main engine without sea margin on calm sea

  Dredging speed abt. 6.0kt

  on designed draught at maximum, output of main engine without sea margin (Drag head resistance: 4t)

  Designed fuel consumption abt. 9.2t/day

  at maximum rating of main engine with the fuel oil of 10,200kcal/kg in L.C.V.

  Endurance abt.2,200 sea miles

  on the basis of the above mentioned free running speed and fuel oil capacity (90% full)

・ Accommodation

Captain, Chief Engineer		4 persons
Officer class		8 persons
Crew class		24 persons
	Total	36 persons

Public space : Officer's mess
: Crew's mess
: Recreation room

・ Others

Bow thruster	180kw	1 set
Derrick (onto Foremast)	4t	1 set
Steering machine	Electro-hydraulic 9t-m	2 sets
Windlass	Electro-hydraulic 4.5t x 9m/min	2 sets
Life raft		as per rule

(2) Dredge Part

・ System and Particulars

System: Side drag type (Stab'd side)

Maximum dredging depth: 20m
on light load condition with drag arm inclination of abt.45 degree

Dredge pump: 4,000m^3/h x 17m 1 set

Drag head: Modified Californian type

Drag arm: Internal dia 600mm x 10mm wall thickness

Swell compensater: Hydraulic pneumatic type
Cylinder stroke; max.2.5m

Dredge pipe: Suction pipe, Nominal dia 600mm
Discharge pipe, Nominal dia 550mm
sch.30 pipe

Hopper door: Hinged type, hydraulic cylinder driven 12 sets

Drag arm hoisting system:

Drag head davit and winch (hydraulic)
Trunion carriage, winch (hydraulic)
Intermediate joint davit and winch (hydraulic)

- Automation and Remote Control

Dredge pump
Remote speed control of dredge pump engine from wheelhouse
Start and stop of the engine at machine side

Drag arm
Remote hoist and lower from wheelhouse
Start and stop of hydraulic pump for drag arm at machine side

Dredge valve
Remote open and shut from wheelhouse
Start and stop of hydraulic pump for dredge valve at machine side

Hopper door cylinders
Remote open and shut from wheelhouse
Start and stop of hydraulic pump for operating cylinder at machine side

(3) Machinery part

- System and Particulars

Main engine: Vertical, single acting,4 cycle, turbo-charged, non-reversible marine diesel engine
Rating; abt.1,200ps
No.: 2 sets
Propeller: Nickel aluminum bronze fixed pitch, 5 bladed
No.: 2 sets
Reduction gear: with reversible function 2 sets

Dredge pump engine:

Vertical, single acting,4 cycle, turbo-charged,
marine diesel engine 1 set
Rating; abt. 600ps

Main generator engine:

Vertical, single acting,4 cycle, turbo-charged,
marine diesel engine 2 sets
Rating; abt. 660ps, 450kw

Harbour use generator engine 1 set
Rating: abt. 150ps, 100kw

- Auxiliary Machinery

Main engine cooling S.W.pump	2
Main engine cooling F.W pump	2
Bilge and ballast pump	1
Fire and general service pump	1
Main engine stand-by L.O.pump	2
Gear box stand-by L.O.pump	2
Engine room F.O.transfer pump	2
L.O.transfer pump	1
Engine room oily bilge pump	1
Waste oil transfer pump	1
Sluice valve flushing pump	1
Pump room oily bilge pump	1
Pump room F.O.transfer pump	1
Pump room waste oil transfer pump	1
Pump room fire and bilge pump	1
Emergency fire pump	1
Air cond.ref.cooling S.W.pump	1
Gland sealing water pump	1
Main air compressor	2
Main air reservoir	2
Pump room air reservoir	1
Emergency shut off valve air reservoir	1

Main engine jacket cooling F.W. cooler	2
Oily water separator	1
Fresh water pump	1
Sanitary water pump	1
Universal machine	1
Electric grinder	1
Air dryer	1

- Automation and Remote Control

  Automatic start and stop of:

  Fuel oil transfer pump at F.O. service tank low/high level

  Main air compressor

  Fresh water pump

  Sanitary water pump

  For bow thruster

  Remote start, stop and impeller pitch control from wheelhouse

  For Main engine and gear box

  Remote speed and reversing control from wheelhouse

  Start and stop of main engine at machine side

(4) Electric Part

- Supply System

Power:	AC380V 50Hz 3phase
Lighting:	AC220V 50Hz 1phase
Communication:	AC220V 50Hz 1phase / DC24V
Instrument:	AC220V 50Hz 1phase / DC24V
Navigation and Radio equipment:	AC220V 50Hz 1phase / DC24V

- Electric Equipment

Main switchboard	Deadfront type	1 unit
Transformer		1 set
Storage battery		1 set

- Lighting

Accommodation space:	Fluorescent lamp	
Machinery space:	Fluorescent lamp	
Deck:	400W Mercury floodlight	
Search light:	1,000W	1

- Communication and Navigation Equipment

Sound power telephone	1
Public addresser	1
Steering control console	1
Radar	1
Echo sounder	1
Window wiper	2
General alarm and fire alarm system	1
Position fixing equipment	1

- Radio Equipment

MF/HF Radio telephone	1
VHF Radio equipment	1
TV receiver with video tape deck	1
Broad casting radio receiver	1

- Dredging Instrument

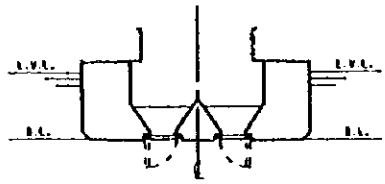
Dredge pump pressure indicator	1
Drag arm remote control console	1
Drag arm indicator	1
Draft and load indicator	1
Dredge remote control console	1

- Cooking Equipment

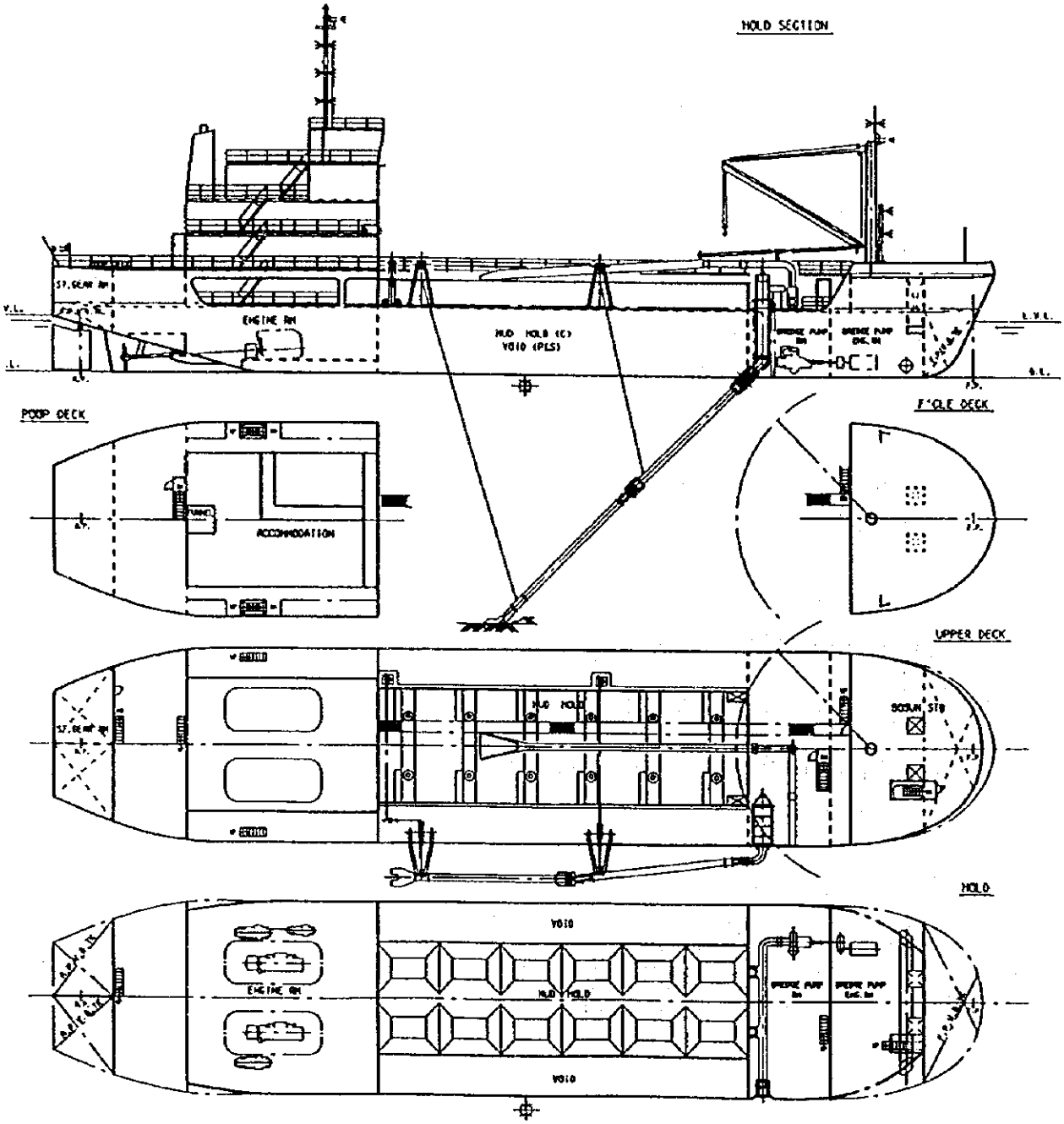
Electric oven	1
Baking oven	1
Refrigerator	1
Water boiler	1

PRINCIPAL PARTICULARS

LENGTH (O.A.)	abt. 70 m
LENGTH (B.P.)	65.0 m
BREDTH (M.D.)	14.0 m
DEPTH (M.D.)	4.7 m
DRAFT (M.D.)	4.0 m
DEADWEIGHT	abt. 1,800 t
MAIN ENGINE	Diesel Engine 1,200 ps x 2 sets
COMPLEMENT	36 p



HOLD SECTION



Chapter 3 Construction Plan

CHAPTER 3 CONSTRUCTION PLAN

3-1 Construction Plan

3-1-1 Construction Concept

After conclusion of the Exchange of Notes for the Project, Mozambican government and the selected consultant proceed detailed design of the dredger and invite bids to shipbuilder for construction of the dredger, based on the concept of basic design.
As the dredger is a working ship employed for the special purpose, the remarkable techniques are required not only for the designing but also for the construction works. To construct the dredger, the strict quality control and construction schedule control are essential. To meet with these requirements, the construction of the dredger should be planned to do at one of Japanese shipbuilding companies, who has technique and experience in building of similar type of dredgers and also has enough engineering capability.
The selected shipbuilder by the tender shall enter into the shipbuilding contract, and carry out construction works under inspection and supervision of the classification society and consultant. And also the shipbuilder shall arrange instruction and training program for crew at the shipyard and manufacturers to become proficient in handling the machinery and equipment installed on the vessel during construction works.
After completion of the dredger, the shipbuilder shall transport it under his expense and risk to Mozambique, and deliver after the confirmation of proper function.
After delivery of the dredger at Mozambique, on the job training shall be undertaken by a dredging apparatus engineer dispatched by the shipbuilder.

3-1-2 Implementation Conditions

In implementation of the Project, the following attentions should be paid.

(1) Quality Control

As the dredger will be employed in Mozambique and classed under the foreign classification, the Consultant , as the representative of Executing Agency, shall have close contact with the shipbuilder to make sure the construction schedule and inspection procedures, and shall visit the shipyard to attend and/or supervise

the tests of material and equipment, as necessary.

(2) Schedule Control

As the ship is a trailing suction self-propelled hopper dredger with specialized equipment, schedules of procurement, installation and calibration of the equipment utilized for construction shall be thoroughly checked with special attention. When some machinery or equipment are imported from foreign countries, it is recommendable to make a detailed schedule for control the procurement and installation schedules and close up the critical pass of the construction works.

3-1-3 Scope of Works

When the Project will be executed in Japan's Grant Aid program, the scope of works of Mozambique and Japan shall be as follows:

(1) Scope of works shared by Japan

1. To carry out the supervising services from the detailed design of the planned dredger, assistance of tendering works, and supervision of the construction works of the vessel at the shipyard.
2. To undertake construction of the dredger, procurement of material, machinery , equipment and spare parts, and required tests and trial in Japan.
3. To assist training of crew for operation technique of the dredger and for handling the dredging equipment.
4. To transport the dredger to Beira Port after completion.

(2) Scope of works shared by Mozambique

1. To obtain all authorization and/or permissions required in Mozambique for implementation of the Project, construction and take delivery of the dredger.
2. To obtain the provisional nationality certificate and necessary documents for the transportation of the dredger from Japan to Mozambique.
3. To secure the quay for safe mooring of the dredger.
4. To prepare and execute all the necessary procedures, to accept the dredger

quickly into Beira Port when she arrives from Japan, to import the dredger and its equipment, and to register her in Mozambique.

5. To undertake education of the dredge operators by OJT.

3-1-4 Consultant Supervision

To assist the Executing Agency, a Japanese consultant will execute consistent consulting services from detailed design until delivery of the planned dredger, including provision of tendering works, entering the building contract, inspection and approval of production drawings, and supervision and inspection of construction works. During the construction of the dredger, the consultant, with their specialists for construction and outfitting of hull part, outfitting of machinery and dredging parts, will carry out supervision, including attendance to tests and trials and will give necessary instruction, advice and recommendation as necessary in consideration of the schedule of construction works. Furthermore, the guidance and advice on the method of operation of the dredger will be given by the time of delivery.

3-1-5 Procurement Plan

Considering the dredger will be built in Japan, Japanese material, machinery and equipment shall be adopted as much as possible in general to obtain economical advantates, and also to actualize merits easily on negotiation with manufacturers, assurance of delivery time, attendance to tests at factories, education and training of crew at factories, etc. However, import of machinery and equipment will be considered, if their performance are reliable and prices are reasonable. Further, for an easy exchange of spare parts, a supplement of consumables, maintenance and repair in Mozambique in future, special attention shall be paid to import from manufacturers who have agents in Mozambique or neighboring countries.

3-1-6 Implementation Schedule

Work of detailed design for the Project will be completed in about 4 months after the Exchange of Notes for the detailed design. The shipbuilding contract will be signed after about 4 months from the Exchange of Notes for the shipbuilding, about 13 months will be required for the construction, and further about 3 months will be necessary for transportation from Japan to Beira Port and delivery.

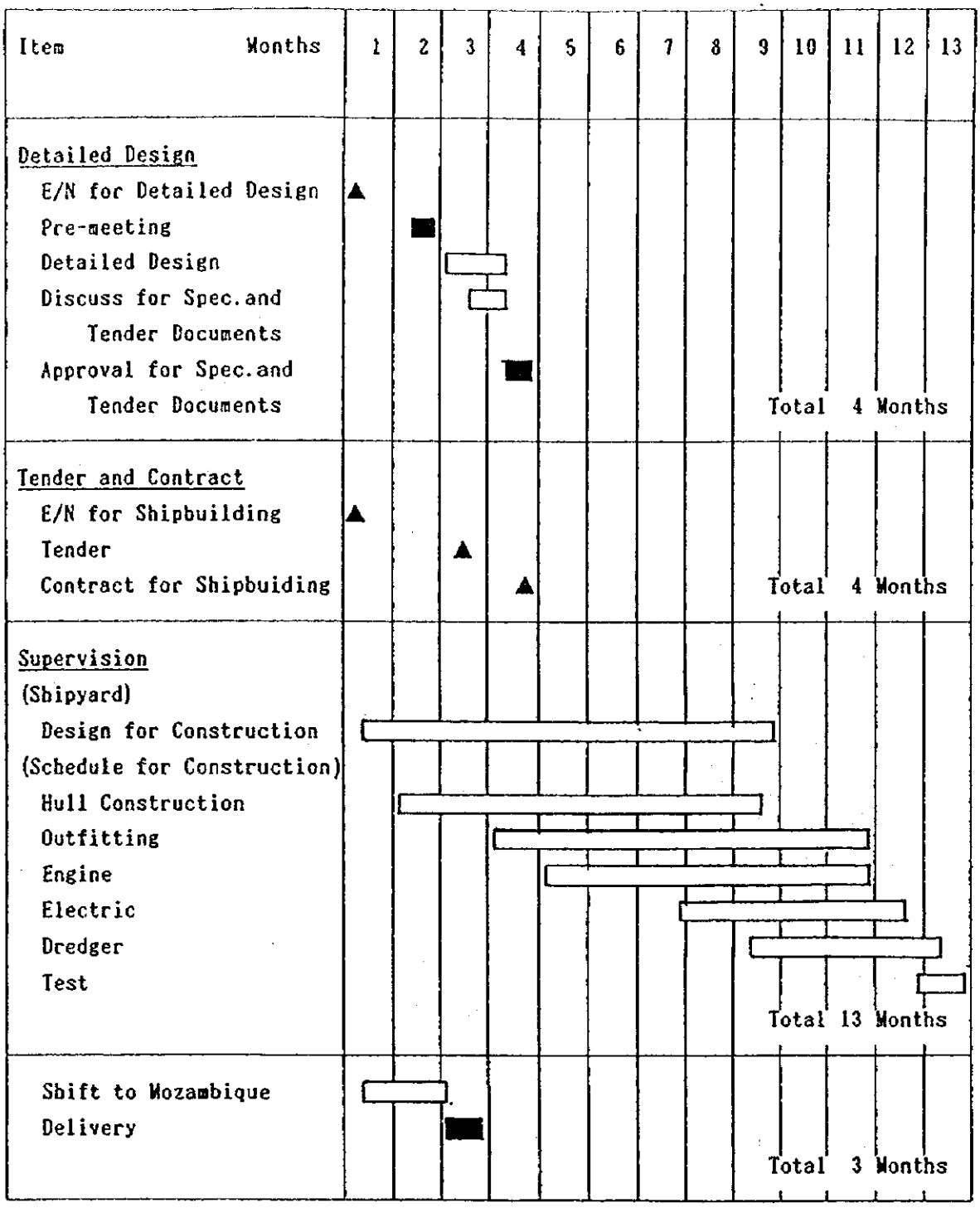


Fig. 3-1-1 Implementation Schedule

3-2 Operation and Maintenance Plan

(1) The operation and maintenance of the planned dredger will be conducted by EMODRAGA.

1. Periodical Maintenance
   Periodical maintenance of machinery and equipment is carried out by crew on every Saturday.
2. Periodical Inspection and Repair
   Annual inspection and repair works for about 4 weeks are scheduled and carried out in the dry dock of Beiranave.
3. Special Repair and Renewal of Consumables
   When stoppage of the dredger is required for emergency repair and/or renewal of the consumables, those works will be done at the mooring quay. These no-working days, including idle days due to bad weather, are estimated for about 4 weeks in a year.

(2) Facilities for Maintenance and Repair

1. Mooring Point of the Dredger
   For the convenience of crew and easy handling of equipment and consumables into the dredger, EMODRAGA are planning to use Chiveve Basin, where they are currently mooring their service boat, and have started deepening work of the spot and removal of obstacles thereabout.
2. Base for Maintenance
   Beiranave Shipyard in Chiveve area has a dry dock (110m x 17m x 6.5m) and this dock will be the base for repairing the dredger. 40% share of Beiranave is owned by Lisnave, a major shipbuilding company in Portugal which is undertaking technical assistance in new shipbuilding and ship-repair, the periodical docking of dredger can be carried out there.
3. Other Facilities
   In Beira, EMODRAGA have stores and repair facilities for small equipment, and also CFM have a machine shop, these facilities are available for the dredger.
   When big repair or conversion becomes necessary, it can be undertaken by Dorbyl Marine Ship Repair in Durban Port, the Republic of South Africa,

where the repair works of Rovuma have been executed.

(3) Operation and Maintenance Cost

Annual operation and maintenance cost is estimated as follows: (Unit : US Dollar)

Labour cost	54 persons (18 persons x 3 groups)	253,800
Provisions cost	36 persons (18 persons x 2 groups on board)	97,200
Fuel oil cost		448,800
Lubricating oil cost		89,800
Maintenance and repair cost		300,000
Insurance premium		152,000
Overhead charge		268,300
Total		1,609,900

Annual depreciation cost will be U.S.$540,000, on the basis of the period of depreciation being 25 years and the residual value after the depreciation being 10%.

The maintenance cost will be shared by an ordinary profit. The ordinary profit of CFM-C Port Division, which is responsible body of control of Beira Port, was US$12,787,000 in 1996. Therefore, operation and maintenance cost for the dredger was 12.6% of the ordinary profit, such expenditure would not be a big burden. Further, considering the benefit by growing of handling cargo in Beira Port due to reduction of the tide waiting time by implementation of the Project, there would be no problem in allocation of such budget.

Satisfactory assistance from CFM in the future can be expected, from the fact that CFM bore repairing cost of Rovuma in the amount of US$400,000 before sending her to the dredging work of Beira Port in this September, and also it had born required expenses in the past whenever in need.

Chapter 4 Project Evaluation and Recommendation

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4-1 Project Effect

As mentioned in 2-2-1, Present Status of Channel and Calling Ships, maintaining the channel water depth at 6.5m as aimed for in this project will enable 83% of calling vessels (when based on the number of ships that called in 1996) to enter the port almost without tide waiting. The suitability and effect of this improvement will be verified and evaluated with respect to reduction in tide waiting time, as described below:

4-1-1 Suitability of this Project

In the Study for Maintenance and Improvement Plan of Access Channel of Beira Port, actual situation of the channel was carefully surveyed. The channel was dredged down to 8m deep during 1989 and 1990 for maximum use of the port facilities, but it has been filled up now. Under the circumstances, the plan to improve the tide waiting time, expecting increase of ships enter into Beria Port in the future, was made to maximize the economical benefit thereof.

In the Basic Design Study, the suitable dredger under Japan's Grant Aid was designed for a start to reduce present tide waiting hours.

Table 4-1-1 below shows the volume of cargo handled by and the number of ships calling on the port over the past decade.
According to this record, cargo volume increased by 40% in 1992 when the civil war finally came to an end and the port began to enter into full-fledged operation. The level of cargo volume tended to increase further despite the fact that tide waiting time continuously increased due to advancing siltation.

Table 4-1-1 Statistics regarding cargo handled and ships calling at Beira Port

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cargo handled (in 1,000t)									
Transit *1	1,083	1,293	1,439	1,297	1,941	2,149	2,121	1,970	2,246
Mozambican Export/Import *2	272	301	232	280	370	395	291	465	304
Mozambican Domestic Trade	162	161	158	127	81	94	53	53	53
Mozambican Total	434	462	390	407	451	489	344	519	357
Total volume of cargo handled	1,517	1,755	1,829	1,704	2,392	2,638	2,465	2,488	2,603
Nos. of Calling Ships									
Ocean-going ships *3	272	270	266	260	297	365	341	311	315
Domestic trade ships	174	235	200	220	124	105	82	56	49
Total number of calling ships	446	505	466	480	421	470	423	367	364
Transported cargo per ship (*1 + *2)/*3 (t)	4,982	5,904	6,282	6,065	7,781	6,970	7,073	7,830	8,095

On the other hand, it is observed that volume of cargo transported by a ship on average has been becoming steadily larger, indicating a tendency in which the calling ships have been becoming larger in size. This tendency is thought to reveal the strenuous efforts on the side of shipping companies to enhance transport efficiency as much as possible by increasing ship size even at the cost of possible economic loss caused by tide waiting.

In other words, this would suggest that if tide waiting time could be shortened, the demurrage loss saved by such a shortening of the waiting time could be converted into a profit for these companies. Moreover, transport efficiency can be improved by an increase in ship size and cargo volume to be hauled, thereby bringing forth a considerable economical effect.

Table 4-1-2 below shows the tide waiting time, by ship type, saved by deepening the channel water depth from the present 5.0m to 6.5m on the 1996 record. It is calculated by first obtaining the difference between the number of calling ships having a draft of more than 7.5m (the allowable draft under the present 5.0m water depth) and those with a draft exceeding 9.0m (the allowable draft under the deepened 6.5m water depth) and then by multiplying the difference by the averaged tide waiting time per ship.

Table 4-1-2 Reduction in tide waiting time when water depth kept at 6.5m

(1996)

Type of Ship	Nos. of Ships entered with draft exceeding 7.5m (Case of 5.0m Water Depth) (a)	Nos. of Ships entered with draft exceeding 9.0m (Case of 6.5m Water Depth (b)	Difference of Nos. of Ships (c) = (a) - (b)	Averaged Tide Waiting Hours per Ship (d)	Total Tide Waiting Hours (e) = (c) x (d)
Oil Tankers	48	27	21	18.4	386.4
Bulk Carriers	40	22	18	5.4	97.2
Container Ships	49	4	45	22.7	1,021.5
General Cargo Ships	17	8	9	23.8	214.2
Total	154	61	93		1,719.3

As indicated above, on the basis of the record for 1996, 93 (equivalent to 60%) of 154 ships that underwent tide waiting for entry to the port could avoid the tide waiting and as a result an aggregate tide waiting time of some 1,720 hours could be saved when the channel water depth is maintained at 6.5m.

4-1-2 Project Benefits

(1) Saving of Tide Waiting Time and Increase of Calling Vessels

As stated in 4-1-1, when the channel water depth is maintained at 6.5m, a saving in tide waiting time can be expected, when based on the 1996 record, for 93 ships or 60% of the total 154 that were compelled to do tide waiting for entry to the port. Moreover, such a water depth will enable the entry of regular service ships of a larger size than now and also the haulage of cargo in a larger lot by the ships that have had to carry only as much cargo as allowable by the present draft limitation, thus will realize an increased transport efficiency for them. Furthermore, such a water depth will make expectable the calling of large-sized ships with a high demurrage cost and container ships bound to keep a service regularity that have been refraining from calling at this port. Particularly for container ships that occupy the biggest share in number of calling ships (standing at 42% of the total calling ships in 1996) and that have to keep up to punctuality, they can enter the port

almost without tide waiting at the water depth of 6.5m.

(2) Increase in Size of Enterable Ships

The past record shows that, in spite of increasing tide waiting time due to shallowing channel water depth by continuous siltation, volume of cargo transported per ship on average has been increasing steadily, indicating a tendency of the size of calling ships getting larger. It can be interpreted to imply the shipping firms' effort made to improve transport efficiency by increasing ship size to cover possible cost increase by tide waiting.

By maintaining the deepened water depth of 6.5m, therefore, large oil tankers or container ships that can not access to the port at the present status can be made possible to enter the port without or with much shortened tide waiting. Moreover, thanks to an increase of her allowable draft by such deepened water depth a ship will become possible to transport cargo in a larger lot. Thus, both will lead to a reduction of transportation cost, and thereby will contribute to the development of Mozambican economy including the stable supply of daily commodities.

(3) Other Benefits

1) Storage cost will be decreased due to higher efficiency in cargo handling resulting from shortened tide waiting.
2) Transportation costs for oil products to Zimbabwe will be reduced by use of larger oil tankers made possible by the deepened water depth.
3) Punctuality in service that will be made easier for calling ships will contribute to an increase in volume of cargo handled at the port and also to enhancing effectiveness of the port publicity activity.

Implementation of this project aiming at reviving the port function of Beira, which has been seriously exacerbated by incessant siltation from the originally rehabilitated status, can be expected to contribute significantly to the economic development of the Republic of the Mozambique as well as the other SADC countries.

4-2 Recommendation

In order to realize the afore-mentioned effects that can be brought by the implemetation of this project, the following tasks should be thoughtfully addressed.

(1) Support and Cooperation of Government Organizations Concerned

In respect of necessary budget appropriations for the operation and maintenance of the new dredger by EMODRAGA, EMODRAGA should be fully supported by the CFM who is in a position to manage the Beira port operation and to place orders with EMODRAGA for dredging work. Though the CFM is committed to such full support, appropriate supervision by the Ministry of Transport and Communications is also required so that the ministry can deal with problems should such anomalous situations occur as the impossibility of EMODRAGA to secure necessary budget fund.

(2) Appropriate Maintenance of Dredger

EMODRAGA is deemed to be sufficiently capable of operating and maintaining the new dredger. However, considering the necessity of more accurate and systematic maintenance methods to be applied to the new dredger because of its more recent design than the existing old dredger, appropriate training is desirable so that responsible staff and maintenance personnel can learn modern maintenance methods.

At the time of delivery of the new dredger, manuals describing periodic maintenance procedures (including instructions for parts replacement frequency, time schedule of orders for spare parts, etc.) will be furnished to EMODRAGA, in addition to operation manuals.

(3) Training for Ship-maneuvering and Machinery Operation

Technical transfers to EMODRAGA that are considered necessary for the safe and efficient operation of the dredger in terms of ship-maneuvering, dredging

machinery operation, and planning and management of dredging work need to be carefully planned on the basis of observations of EMODRAGA's own training plan and its capability of implementing them. In addition, the result of such technical transfers should be followed up during the subsequent two or three years in order to determine whether it should be supplemented or not.

(4) Execution of Interim Dredging

As this project is intended to provide for maintenance dredging in order to keep the channel water depth at 6.5m, the present water depth of 5m will need to have been deepened to 6.5m by the time of the onset of operation of the new dredger.

The volume of siltation to be dredged in order to deepen the channel water depth by 1.0m is estimated at 2,630,000m^3 based on the record of dredging work done in 1989 and 1990. In addition, the siltation that develops even during dredging work is to be taken into account, and this annual volume can be estimated from the curve showing the relation between Channel Water Depth and Maintenance Dredging. The relation of this siltation volume and dredging volume for deepening with respect to water depth to be deepened from 5.0m is shown, as follows:

Water depth deepened from 5.0m	0.5m	1.0m	1.5m
Siltation volume (1,000m^3/year)	624	713	820
Dredging volume to be removed (1,000m^3/year)	1,315	2,630	3,945

As the above-shown values indicate the annual volumes, these figures should be increased by the volume calculated in proportion to the extended time, if the dredging work continues for more than one year.

According to the data for ten days of dredging work done by the dredger ROVUMA in Beira from September 26, 1997, she dredged some 8,000m^3 of soil per day on average.

This 8,000m^3 can be converted to 7,000m^3 which is the volume when existing at the sea bed. Consequently it is expected a volume of 1,540,000m^3 of soil can be dredged annually on the basis of forty-four annual working weeks.

If the ROVUMA can continue to work at this annual dredging capacity for two years, then the channel water depth can be deepened to about 5.7m. Therefore, the dredging work to deepen the water depth to 6.5m can not be completed in two years through the use of ROVUMA alone. For this purpose, employment by hiring or contracting of an additional dredger capable of dredging 2,500,000m^3 soil for the years will be necessary for simultaneous use with the ROVUMA.

Alternatively, in case that the new dredger is put into service as soon as it is ready, with the ROVUMA working continuously, work to deepen the channel depth to 6.5m can calculably be completed in 3.6 years (assuming 1.6 years operation by the new dredger).

Moreover, if the new dredger can work for forty-five weeks/year instead of forty-four and for six days/week instead of five, working efficiency can be increased by 22.7%. In that case, the new dredger can be expected to be capable of dredging a volume of 1,890,000m^3/year, and the time of completion required for deepening the channel depth to 6.5m can be shortened to 3.2 years from the said 3.6 years.

Appendices

1. MEMBER LIST OF THE SURVEY TEAM

Leader	Mr.YONEDA Hiroshi	Senior Assistant for Grant Aids, Grant Aids Division Economic Cooperation Bureau Ministry of Foreign Affairs
Technical Advisor	Mr.MIYASAKA Hiroyuki	International Affairs Office Shipbuilding Division Maritime Technology & Safety Bureau Ministry of Transport
Operation and Management Planner	Mr.KATSUTA Hozumi	Development Specialist Japan International Cooperation Agency
Chief Consultant/ Chief Designer	Mr.SUZUKI Toshimasa	Overseas Shipbuilding Cooperation Centre
Dredger Designer/ Operation and Management Planner	Mr.IKEBA Tadashi	Overseas Shipbuilding Cooperation Centre
Engine Designer/ Electrical and Nautical Instrument Designer/ Cost Estimator	Mr.SHIGENAKA Akinori	Overseas Shipbuilding Cooperation Centre

2. SURVEY SCHEDULE

	Date	Day	Survey Activities
1	Oct.04	Sat	Lv.Tokyo
2	Oct.05	Sun	Ar.Maputo via Singapore and johannesburg
3	Oct.06	Mon	Courtesy call,EMODRAGA ,CFM,Ministry of Transport and Communications, Ministry of Planning & Finance,Ministry of Foreign Affairs
4	Oct.07	Tue	Lv.Maputo,Ar.Beira Courtesy call, EMODRAGA,H.E.Governor of Sofala Province,CFM-C Visit Beira Port,B.P.T.C.C.,EMODRAGA's Facilities,BEIRANAVE's Dry Dock Meeting and Discussion with EMODRAGA
5	Oct.08	Wed	Boarding on the T.S.H.D. "ROVUMA" and observe dredging operations Discussion with EMODRAGA Lv.Beira,Ar.Maputo
6	Oct.09	Thu	Discussion with EMODRAGA Prepare a draft of Minutes of Discussions
7	Oct.10	Fri	Signing of the Minutes of Discussions
8	Oct.11	Sat	Lv.Maputo(Mr.YONEDA,Mr.MIYASAKA) Reorganize data
9	Oct.12	Sun	Ar.Paris,Lv.Paris (Mr.YONEDA,Mr.MIYASAKA) Reorganize data
10	Oct.13	Mon	Ar.Tokyo (Mr.YONEDA,Mr.MIYASAKA) Discussion of the technical matters with EMODRAGA
11	Oct.14	Tue	Lv.Maputo,Ar.Beira(Mr.SUZUKI,Mr.IKEBA,Mr.SHIGENAKA) Reorganize data
12	Oct.15	Wed	Lv.Maputo,Ar.Harare,visit to the EOJ and JICA (Mr.KATSUTA) Discussion of the technical matter with EMODRAGA
13	Oct.16	Thu	Lv.Harare,Lv.Johannesburg (Mr.KATSUTA) Observe Work shop of BEIRANAVE and CFM Observe Accommodation space in "ROVUMA"
14	Oct.17	Fri	Ar.and Lv.Singapore(Mr.KATSUTA9 Signing on the Memorandum of Technical Discussions

	Date	Day	Survey Activities
15	Oct.18	Sat	Ar.Tokyo (Mr.KATSUTA) Lv.Beira,Ar.Maputo(Mr.SUZUKI,Mr.IKEBA,Mr.SHIGENAKA)
16	Oct.19	Sun	Lv.Maputo,Ar.Durban via Johannesburg
17	Oct.20	Mon	Observe Repair facility " DORBYL MARINE (PTY)LTD." Discussion with " SAFELINE EXPORTERS" concerning to the spare parts of Machineries Lv.Durban,Ar.Johannesburg
18	Oct.21	Tue	Lv.Johannesburg,Ar.Harare,Visit to EOJ(Mr.SUZUKI) Observe spare parts suppliers (Mr.IKABA,Mr.SHIGENAKA)
19	Oct.22	Wed	Lv.Harare,Ar.Johannesburg (Mr.SUZUKI) Observe spare parts suppliers (Mr.IKEBA,Mr.SHIGENAKA)
20	Oct.23	Thu	Lv.Johannesburg (Mr.SUZUKI,Mr.IKEBA,Mr.SHIGENAKA)
21	Oct.24	Fri	Ar.and Lv.Singapore
22	Oct.25	Sat	Ar.Tokyo

3. LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

1) MOZAMBIQUE

MINISTRY OF FOREIGN AFFAIRS AND COOPERATION

MR. AMOUR ZACARIAS KUPELA	National Director of Asia
MR. CHICO MORTAR	Japan Desk

MINISTRY OF TRANSPORT AND COMMUNICATIONS

DR. ALFREDO F.S. NAMITETE	National Director of Maritime Affairs

MINISTRY OF PLANNING & FINANCE

MR. VICTOR DE SOUSA	National Director of Customs Affairs

SOFALA PROVINCE

MR. FELISBERTO PAULINO TOMAS	Governor

MOZAMBIQUE PORTS AND RAILWAYS (CFM)

MR. RUI CIRNE P.C. FONSECA	Chairman
MR. MIGUEL JOSE MATAVEL	Executive Board Director
MR. JOAO AZINHEIRA FILIPE	Executive Director, Center

MOZAMBICAN DREDGING COMPANY (EMODRAGA E.P.)

MR. RASSUL KHAN G. MAHOMED	Chairman & Managing Director
MR. TAYOB ABDUL C. ADAMO	Executive Member of Board
MR. FIDELIO A. SEVERINO P. NHANTSUMBO	Head of Production Division
MR. SIMOES TOMAS FRANCISCO	Head of Administration
MR. GILBERTO B. ESMAEL	Chief Surveyor, Hydrographic Department

SOUTHERN AFRICA TRANSPORT AND COMMUNICATION COMMISSION (SATCC)

MR. E.H. MSOLOMBA	Director
MR. SMAK B. KAOMBWE	Planning Cordinator

EU, DELEGACAO DA COMMISSAO EUROPEIA

MR. RUI COSTA	

BEIRANAVE

MR. HENRIQUE PINTO	Project Manager

2) SOUTH AFRICA

DORBYL MARINE (PTY) LTD.

MR. TREVOR BURNETT	General Manager of Ship Repair Division

SAFELINE EXPORTERS

MR. KEITH MORRIS	Managing Director

3) JAPAN SIDE

EMBASSY OF JAPAN IN ZIMBABWE

Mr. SHUJI CHIDA	Second Secretary

JICA OFFICE IN ZIMBABWE

Mr. NAKAMURA	Resident Representative

Minutes of Discussions on the Basic Design Study on the Project for Improvement of the Facilities for Dredging at Beira Port in the Republic of the Mozambique

In response to a request from the Government of the Republic of Mozambique, the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of the Facilities for Dredging at Beira Port in the Republic of Mozambique (Project), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mozambique a Basic Design Study Team (Study Team), headed by Mr. YONEDA Hiroshi, Senior Assistant for Grant Aid, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs of Japan, and is scheduled to stay in the country from October 5 to October 19, 1997.

The Study Team held a series of discussions with the officials concerned of the Government of Mozambique and conducted a field survey at study area. As a result of the discussions and field survey, both sides confirmed the main items described in the attached sheets. The Study Team will proceed to further works in Japan and prepare the Basic Design Study Report.

Maputo, October 10, 1997

Dr. Alfredo F. S. Namitete
National Director of Maritime Affairs
National Directorate
Ministry of Transports and Communications(MTC)

Mr. YONEDA Hiroshi
Leader
Basic Design Study Team

Mr. Rui Cirne P. C. Fonseca
Chairman
Mozambique Ports and Railways(CFM)

Mr. Rassul Khan G. Mahomed
Chairman
Mozambican Dredging Public Enterprise
(EMODRAGA)

ATTACHMENT

1. OBJECTIVE OF THE PROJECT

The objective of the Project is to provide an appropriate dredger, the use of which is expected to facilitate the maintenance dredging of the access channel at Beira Port. The dredger, therefore, will be used mainly at Beira Port.

2. RESPONSIBLE, SUPPORTING AND IMPLEMENTING AGENCIES

1) Ministry of Transports and Communications (MTC) is responsible for the Project.
2) Mozambique Ports and Railways (CFM) supports Mozambican Dredging Public Enterprise (EMODRAGA) by way of obtaining EMODRAGA's dredging services on a direct-appointment basis.
3) EMODRAGA implements the Project and provides dredging services to CFM.

3. PROJECT SITE

Mooring site for the proposed dredger will be in the Beira Port as shown in ANNEX-1.

4. DRAFT DESIGN OF THE DREDGER

1) The proposed dredger will have a hopper capacity of 1,000 cubic meters under the Project, although the initially-requested dredger was with a capacity of 2.5 thousand cubic meters.
2) On the basis of Mozambican requests for the proposed dredger, its specifications will be determined in the further studies in Japan. Mozambican side will be informed of such result through the Japanese Embassy in Harare, Zimbabwe, before the signing of Exchange of Note.

5. JAPAN'S GRANT AID SYSTEM

Japanese side explained briefly the system of Japan's Grant Aid. Details of the system is in ANNEX-2.

6. NECESSARY MEASURES TO BE TAKEN BY MOZAMBICAN SIDE

1) Mozambican side will take necessary measures described in ANNEX-3 for smooth implementation of the Project.
2) Mozambican side informed the Study Team that:
   (1) No parliamentary approval is required for the Project before or after the conclusion of Exchange of Note,
   (2) MTC will obtain government approval by incorporating it into the three year investment plan (PTIP) for the period starting from fiscal year 1998,
   (3) MTC, EMODRAGA and CFM will request the tax exemption for the Project to the Ministry of Planning & Finance.
3) Mozambican side emphasized that they have no intention to privatize both CFM and

EMODRAGA which are government corporations. The government will keep its ownership of all the assets including the proposed dredger. Mozambican side, however, stressed that joint operation with the private companies will be welcomed.

4) CFM confirmed that it will do its best to support EMODRAGA in funding necessary recurrent costs for operation, maintenance and repairing for the proposed dredger.

7. STATUS OF INTERIM DREDGING AND THE DREDGER "ROVUMA"

EMODRAGA started dredging work at Beira Port by using Rovuma from the end of September 1997. Dredging volume is estimated at 500,000 cubic meters within this year. For the years 1998 and 1999, EMODRAGA estimates its dredging volume at about 1.5 million cubic meters per year. Incidentally, Rovuma is supposed to be used for at least 3 years, although the vessel is as old as 35 years.

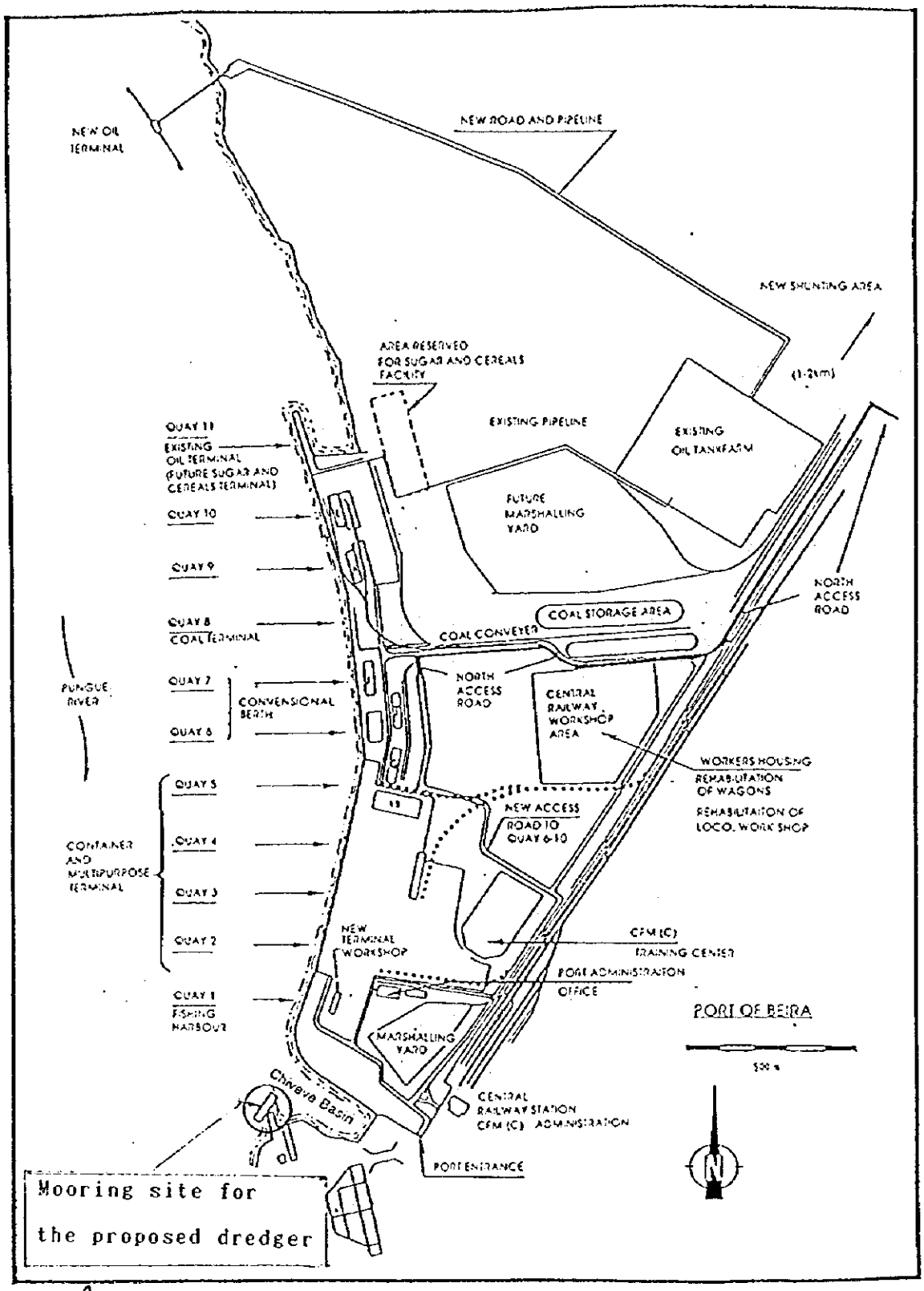
8.FURTHER SCHEDULE OF THE STUDY

Based on the results of the Basic Design Study, JICA will complete the Basic Design Study Report and send it to Mozambican side at the end of January, 1998.

9. TECHNICAL COOPERATION

Mozambican side stressed the need for technical training for the Project. If the training turns out to be necessary, official requests for the technical training should be submitted through diplomatic channels.

ANNEX-1 PROJECT SITE



ANNEX-2 JAPAN'S GRANT AID PROGRAM

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

- Application (A request made by the recipient country)
- Study (Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- Determination of Implementation (Exchange of Notes between the Governments of Japan and the recipient country)

2) At the first step (Application), a request made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs), whether it is suitable for Grant Aid. If the request is confirmed that it has a high priority as the Project for Grant Aid, the Government of Japan instructs JICA to conduct the Study.

At the second step (the Study), the Basic Design Study is conducted by JICA basically under contracts with a Japanese consulting firm to carry out.

At the third step (Appraisal & Approval), the Government of Japan appraises whether or not the Project is suitable for Japan's Grant Aid Program based on the Basic Design Study Report prepared by JICA, and then it is submitted for an approval by the Cabinet.

At the fourth step (Determination of Implementation), the Project, once approved by the Cabinet, is officially determined to implement by signing the Exchange of Notes between both Governments.

In the course of implementation of the Project, JICA will take charge of expediting the execution by assisting the recipient country in terms of the procedures of tender, contract and others.

2. Basic Design Study

1) Contents of the study

The purpose of the study (the Basic Design Study) conducted by JICA is to provide basic documents necessary for the appraisal by the Government of Japan whether or not the project is viable for Japan's Grant Aid Program. The contents of the Study are as follows :

a) to confirm the background of the request, objectives and benefits of the Project and institutional capabilities of the recipient country necessary for the implementation,
b) to evaluate the appropriateness of the Grant Aid from the technological, social and economical points of views,
c) to confirm the basic concept of the plan mutually agreed upon through discussion between both sides,
d) to prepare a basic design of the Project,
e) to estimate rough cost of the Project.

The contents of the original request are not necessarily approved as the contents of the Grant Aid as it is. The Basic Design of the Project is confirmed considering the Japan's Grant Aid Scheme.

In the implementation of the Project, the Government of Japan requests the recipient country to take necessary measures in order to promote its self-reliance. Such measures must be

guaranteed even though they may fall outside the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations in the recipient country in the Minutes of Discussions.

2) Selection of Consultants

For a smooth implementation of the Study, JICA selects a consultant that are registered to JICA by evaluating competitive proposals submitted by those consultants. The selected consultant carries out the Basic Design Study and prepares a report based upon the terms of reference made by JICA.

At the stage of implementation after the Exchange of Notes, for concluding the contract regarding the Detailed Design and Construction Supervision of the Project between a consultant and the recipient country, JICA recommends the same consultant which participated in the Basic Design Study to the recipient country in order to maintain the technical consistency between the Basic Design Study and the Detailed Design as well as to avoid undue delay caused by the selection of a new consultant.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds needed to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) Period

The period of the Grant Aid means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as Exchange of Notes, concluding contracts by (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.
However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Purchase of the Products and or Services

Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.
When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.
However the prime contractors, namely, consulting constructing or procurement firms, are limited to Japanese nationals. (The term Japanese nationals means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Verification

The Government of recipient country or its designated authority will conclude contracts

denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This Verification is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country
(As described in ANNEX-3)

7) Proper Use
The recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) Re-export
The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangements (B/A)
a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX-3 NECESSARY MEASURES TO BE TAKEN BY MOZAMBICAN SIDE

Following necessary measures should be taken by Mozambican side on condition that the Grant Aid by the Government of Japan is extended to the Project:

1. to secure, clear, level and reclaim the sites for the Project prior to the Project implementation;

2. to ensure prompt unloading, tax exemption and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;

3. to provide proper access to the Project areas;

4. to exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;

5. to accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works;

6. to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively;

7. to bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement, namely the advising commission of the "Authorization to Pay" and payment commissions;

8. to provide necessary permissions, licenses and other authorizations for implementing the Project, if necessary; and

9. to bear all the expenses, other than those to be borne by the Japan's Grant Aid, necessary for the Project.

10. to ensure the following conditions of the Project.
    (1) recruitment appropriate number of officers, crew, engineers and administrative staff of the dredger constructed under Japan's Grant Aid.
    (2) training of officers and crew of the dredger.
    (3) budgetary provisions for the financing of the recurrent costs related to the operation maintenance and repair of the dredger.

5. MEMORANDUM OF TECHNICAL DISCUSSIONS

MEMORANDUM OF TECHNICAL DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR IMPROVEMENT
OF THE FACILITIES FOR DREDGING AT PORT BEIRA

From 8th October to 17th October 1997,at Maputo and Beira, the Study Team held a series of technical discussions with EMODRAGA's officials and conducted a field survey at study area.

As a result of the discussions and field survey ,both side confirmed the items described in the attached sheets and annexes.

Beira,17th October 1997

Mr.Rassul Khan Gulamo Mahomed
Chairman
Mozambican Dredging Public Enterprise
-EMODRAGA-

Mr.Toshimasa Suzuki
Chief Consultant
Basic Design Study Team

ATTACHMENT

1) OUTLINE SPECIFICATIONS

Outline specifications of 1,000m Trailing Suction Hopper Dredger is as described in Annex-1.

During the discussion,EMODRAGA's officials proposed some modification of specifications as shown in Annex-2.

The Study Team will proceed to further study in Japan and will make best effort to reflect recipient proposal under consideration of budget limitation.

2) TECHNICAL COOPERATION

Mozambican side stressed the need for technical training for the Project.

After held discussions on training purpose,scheme,duration, etc.,based upon Technical Cooperation Program prepared by the Study Team as described in Annex-3.,EMODRAGA's officials requested additional training,details as shown in Annex-4.

the Study Team explained that number and duration of trainees will be determined in the further study in Japan because it is related with the budget of the project cost. Anyhow,it is necessary to request the technical assistance to Japan from EMODRAGA by official requesting letter through diplomatic channels.

EMODRAGA's officials presented the list of courses received by their employees as shown in Annex-5.

3) MAINTENANCE COST

Concerning to maintenance cost of new dredger,both parties discussed the number of complement,output of main engine,etc.

and determined as shown in Annex-6.

In accordance with the further study,fuel consumption of engines shall be modified.

6. REFERENCES

1. The Beira Corridor, Intermodal Transport System

2. Xitimela

3. Welcome to Mozambique

4. PROVISIONAL PLAN of Basic design team from Japan for improvement of the facilities for dredging at Beira port

5. Technical assistance provided under C.M.S.S.Contract financed by Dutch Government

6. New Dredger for Beira port, Technical assistance

7. Questionnaire and Answer related to the New Dredger

8. Questionnaire and Answer related to the repair facility and spare parts supplier in Durban , South Africa

9. DORBYL LTD. ANNUAL REPORT 1997

10. The ship repair service DOBYL MARINE

11. PORT of SOUTH AFRICA 1997

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